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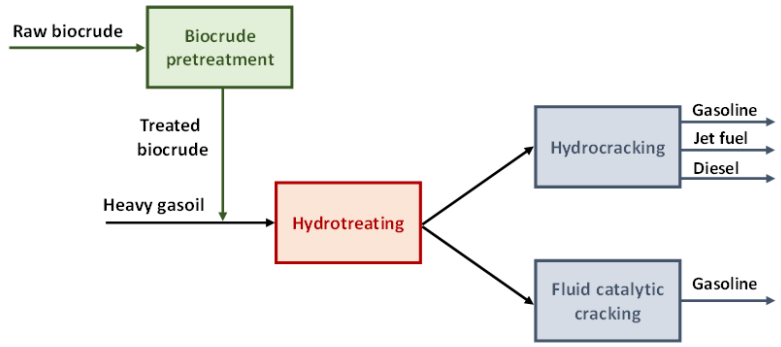
Technology Pathway to Co-Process Biocrudes from Waste Biomass in Petroleum Refineries

Co-processing of biomass-derived crude oil ("biocrudes") with petroleum streams is a promising approach to transition to lower carbon liquid transportation fuels without major capital investment, but quality specifications are lacking to optimize biocrudes for refinery intake. CanmetENERGY Devon and University of Alberta are developing the knowledge base for commercial implementation of co-processing biocrudes with petroleum streams in existing refineries. Lab- and pilot-scale studies, combined with modelling activities, will deliver approaches to treat biocrude before co-processing and set quality specifications for refinery intake, establish guidelines for co-processing biocrude in various refinery units, and assess economics and carbon intensity.



FUNDING DETAILS

RECIPIENT:
CanmetENERGY Devon

PARTNERS:
University of Alberta; Natural Resources Canada

TOTAL BUDGET:
$1,950,000

AI FUNDING:
$600,000

PROJECT DATES:
APR 2019 - APR 2022

PROJECT TRL:
Start: 3
End: 6

APPLICATION

This development is targeted at petroleum refineries and oil sands upgrading facilities. Refiners across Canada already consider co-processing as a potential strategy to comply with current and future renewable fuel and low carbon fuel, such as Canada's *Clean Fuels Regulations*. Alberta currently has four bitumen upgraders and five refineries, all with hydrotreating, hydrocracking, or fluid catalytic cracking capacity that can be used for co-processing biocrude.

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PROJECT GOALS

Under the leadership and coordination of Dr. Anton Alvarez-Majmutov, the key objective of this project is to advance biocrude co-processing to demonstration-ready status (TRL-6), with the following project goals:

- Demonstrate that solvent extraction and mild hydrotreating technologies can be effectively applied to contaminant treatment in biocrude feedstocks prior to co-processing.
- Establish a quality metric to characterize the compatibility of biocrude feeds with petroleum streams at refinery conditions.
- Develop operational guidelines for co-processing adequate proportions of biocrude feedstock in fluid catalytic cracking and hydrocracking units to produce fuel products that meet current renewable fuel regulations.
- Quantify the economic and GHG reduction benefits from co-processing.

BENEFITS TO ALBERTA

- Reduction in GHG emissions from Alberta's oil and gas sector through partial displacement of petroleum streams with biogenic feedstocks.
- Creation of a new market for Alberta's low-value biomass resources, such as agricultural wastes, municipal wastes, and forest residues, to meet biocrude production demand.
- Increased partnerships among forestry, agriculture, and oil and gas sectors to establish biocrude supply and value chains.
- Job creation to build and operate biocrude production facilities in the province and reduction or even potential elimination of biofuel blendstock imports.
- Techno-economic and environmental assessment modelling tools to guide business decisions and policy development.

4 Publications

1 Student Trained

2 Project Jobs

>1,000 Future Jobs

1 New Products/Service

3,000 kt/yr Future GHGs Reduced

CURRENT STATUS

JULY 2021 – IN PROGRESS

- Established a project partner network, including Canadian refiners, biocrude technology developers, and government policy agencies.
- Tested solvent extraction and partial hydrodeoxygenation to treat contaminants in raw biocrude.
- Characterized chemistry and miscibility behaviour of biocrude samples originating from different biomass sources.
- Developed refinery model unit blocks for assessing economics and carbon intensity of co-processing.